

Plan Schedule and Development Guideline

Introduction

This guide will assist the reader through the planning and scheduling of a project; and includes a worksheet for collecting information critical to the project's completion (see Figure 1 - Plan Development [Task ID and WBS]).

Note: *It is recommended that the reader have access to a scheduling tool, such as Microsoft Project, for use in conjunction with this document.*

The document contains six individual chapters, including:

- Task Identification and Work Breakdown Structure (WBS),
- Task and Deliverables Resource Assignment,
- Identifying Task Relationship (Task ID) and Dependencies,
- Task and Duration Estimating,
- Project Schedule and Critical Path,
- Project Plan Optimization and Trade-Offs.

Note: *Although each chapter can stand alone, using all chapters will produce the best results.*

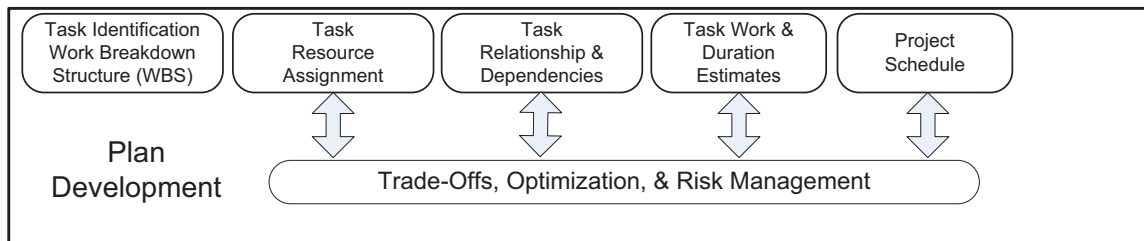


Figure 1 - Plan Development (Task ID and WBS)

Task Identification and Work Breakdown Structure

This chapter outlines the steps for developing a Work Breakdown Structure (WBS), and identifies all the tasks in the project's work. This is the first step in creating a detailed project plan and schedule (see Figure 3 - Task ID & Work Breakdown Structure).

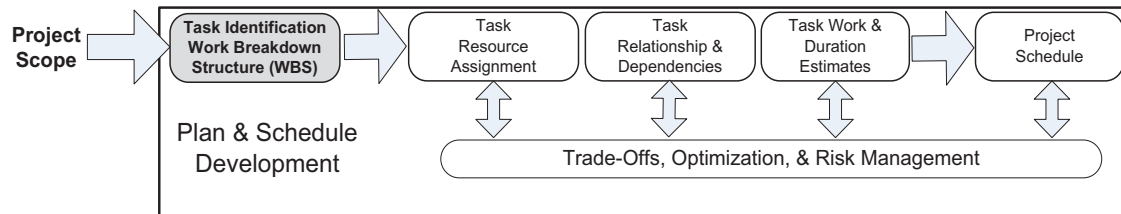


Figure 2 - Task ID & Work Breakdown Structure

Breaking down project goals into tasks *before* identifying delivery dates, resource constraints, specific resources, and task dependencies is a key to successful project scheduling. This procedure will assist the Project Manager in meeting date constraints by objectively identifying all of the work, without losing sight of the real work.

The WBS step helps accomplish the following key objectives:

- Develops an objective, rational view of the amount of work required.
- Helps identify the skills and resources required for project completion.
- Provides a clear framework for assigning clear task definitions and delegating responsibility for completion.
- Lays a foundation for analyzing task dependencies and isolating and managing risks.
- Lays a foundation for developing a bottom-up estimate for the project schedule.
- Allows trade-offs to be made consciously and with the proper consensus.

WBS Creation Overview

The WBS is the first step in developing a detailed work plan for the project. Task Identification and WBS Creation extends from definition of the Scope to creation of a detailed project schedule.

Steps

1. Utilize the Scope. The project Scope defines the results at the highest level, i.e., what must be created and delivered to the project's customers.
2. Create the Work Breakdown Structure (WBS). Design a top-down hierarchical description of the work required to produce results as outlined in the Project

Scope, and achieve the mission—satisfied stakeholders. This procedure facilitates the following results:

- Provides an approach for separating the work into measurable units, which allows easier and more accurate estimates of duration, needed resources, and time required.
 - Helps ensure that the scope is completely defined and no work has been overlooked.
 - Allows breakdown of work into deliverables, activities, and tasks that can be assigned to individual owners.
3. Develop the Project Schedule based on the WBS. Add resource assignments, task work effort and duration estimates, and dependencies, to all tasks in the WBS.

Top-Down Development for the WBS

Development of a WBS includes identifying Phases, Major Work Groups, and Task Deliverables (see Figure 3 WBS - Top-Down View).

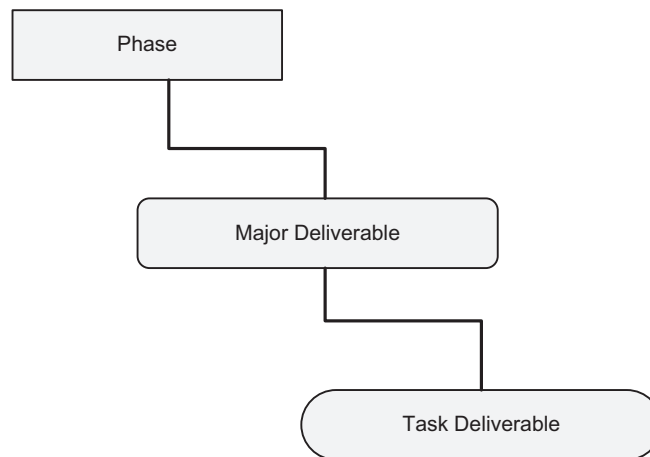


Figure 3 - WBS Top-Down View

Phases

The Project Management Office has identified four distinctive phases within the Project Management Methodology constructed for the State of Montana, including:

Concept,

Initiation/Planning,

Execution,

Delivery/Closure.

Concept

The purpose of this phase is to offer an opportunity to evaluate the proposed project. It provides an orderly and efficient approach to suggesting, reviewing, and judging the merit of the proposed project before significant resources are officially committed. This ensures that resources are allocated only to projects that have merit and are properly defined.

Initiation/Planning

The purpose of this phase is to define and plan the project. During this phase, the Project Manager works to:

1. Identify and kick-off a cross-functional project team to define the detailed scope and requirements for the project,
2. Plan and estimate the work and costs involved,
3. Make trade-offs as necessary to meet the schedule and gain commitment to an agreed-upon balance (including the scope, schedule, and costs) that will meet client's and State's goals.

Execution

The purpose of this phase is to allow the team to create and assess the project's key deliverables. Cross-functional work is performed and deliverables are thoroughly reviewed by the team as they are developed. The Project Manager must also:

1. Monitor the project's progress,
2. Deal with issues and risk,
3. Ensure communication is maintained between the project teams, management, and stakeholders,
4. Review and test deliverables,
5. Gain customer feedback and approval.

Delivery/Closure

The purpose of this final phase is to ensure that all deliverables are transferred to the client and the project is properly closed. The Project Manager and the team will certify that the deliverables are ready to be deployed and the client (or State) is ready to support the customers. And finally, the Project Manager will close out the project and ensure the following tasks are completed:

1. Capture lessons learned,
2. Celebrate success,

3. Hand off and archive project materials,
4. Release team members for other projects.

Major Deliverables and Milestones

Major Deliverables

High-level deliverables are identified from the project's Scope document (i.e., Project Plan, documents, etc). The Project Manager will work with the assigned team to establish 5-to-10 major (first level) WBS work groups under each phase (Concept, Initiation/Planning, Execution/Approval, and Delivery/Closure). This process is primarily associated with expectations about how the work will be organized.

With the major work groups identified, the work will be organized and designated within our methodology. The WBS is constructed in a manner appropriate to: the project's complexity, how the work is spread across the organization, and how the work will be tracked and managed.

Milestones

Interim events are points in time (during the project) that signal the completion of an important segment. They are most useful as measuring, or tracking, points to gauge the progress of the project.

Some milestones are "business-critical" in nature. They are not simply a mechanism for establishing the team's interim targets, but they also have special significance (such as a contractual date that has been established with the client).

Different individuals may identify different numbers of milestones based on their roles in the project. For example, the project sponsor may identify three significant milestones as indicators of how the project is progressing, whereas a team leader may identify eight milestones or checkpoints within a particular phase.

Important: A milestone must be identified to indicate the completion of each phase of the project.

Task Deliverables

Task Deliverables are comprised of the major deliverables under the WBS (see Figure 4 - WBS Example 1).

	WBS	Task Name	Duration
1	1	01 Concept	1 day?
2	1.1	Project Charter Development	1 day?
3	1.1.1	Conduct Mission Statement Review	1 day?
4	1.1.2	Conduct Draft Review	1 day?
5	1.1.3	Perform Document Rewrite	1 day?
6	1.1.4	Conduct Final Review	1 day?
7	1.1.5	Submit Document for Approval	1 day?

Figure 4 - WBS Example 1

Task breakdown levels are dependent on the level of complexity identified in the project plan. However, it is strongly recommended that the Master Project Plan (typically, the name of project plan at the Project Manager's level) not be greater than three levels deep. It is recommended that each team: be responsible for specific deliverables, manages its own project plan towards the shipment of the deliverables, and provides periodic status updates to the Project Manager.

Activities

Each task deliverable is comprised of a number of major activities leading to the achievement of one or more the identified deliverables. Activities are a series of tasks outlined in the lowest level of detail that can comfortably be managed. Team members who will be performing the tasks should be involved in the activity/task planning process. Time estimates for the completion of each task should be based on typical work effort, adjusted to reflect "real world" conditions (see Figure 5 - WBS Example 2).

	WBS	Task Name	Duration
1	1	01 Concept Phase	1 day?
2	1.1	Project Charter Development Major Deliverable	1 day?
3	1.1.1	Conduct Mission Statement Review Task	1 day?
4	1.1.1.1	Schedule Meeting	1 day?
5	1.1.1.2	Reserve Conference Room	1 day?
6	1.1.1.3	Send Meeting Invites	1 day?
7	1.1.1.4	Arrange for Projector	1 day?
8	1.1.1.5	Send Minutes Out	1 day?
9	1.1.2	Conduct Draft Review	1 day?
10	1.1.2.1	Send Draft Out to Team	1 day?
11	1.1.2.2	Schedule Review Meeting(s)	1 day?
12	1.1.3	Perform Document Rewrite	1 day?
13	1.1.4	Conduct Final Review	1 day?
14	1.1.5	Submit Document for Review	1 day?

Figure 5 - WBS Example 2

Engaging the Team in Creating the WBS

This is a team process, and *should not* be done by the Project Manager alone. The Project Manager involves the project team in analyzing and breaking down the work

into a sequence of deliverables, activities, and tasks until the detail defines a manageable project. A suggested process might be:

1. The top level of the WBS is proposed by the Project Manager.
2. A core team meeting is called to review the top level of the suggested WBS, and define the next level of detail. In the meeting, the top level of the WBS is also agreed upon, and the team brainstorms a list of items to include at Level two (e.g., deliverables for each major phase).
3. The team will collaborate to identify subsequent levels of WBS detail. The Project Manager can achieve this by listing the WBS activities and tasks on a whiteboard or flipchart (or attaching paper to the walls of the room).
4. Next, the team writes deliverables, activities, and tasks on sticky notes and attaches them to the whiteboard or wall underneath the appropriate top-level section of the WBS.
5. A draft WBS is sent to team members and others to “sanity check” the contents, and to identify any additional work. Ultimately, the WBS should take into account information from many sources, such as:
 - Other team members,
 - Other Project Managers who have done similar work,
 - Previous project reviews,
 - Other appropriate groups,
 - Expert opinion,
 - Existing WBS templates.

The resulting feedback is incorporated into the WBS.

The updated WBS is reviewed by the Project Manager and the team. The Project Manager determines if the team is ready to proceed to the next Planning step, which is assigning resources to the tasks in the WBS.

How Much Detail Is Enough?

If the tasks in an area are clearly understood and represent well-known work in which the team is experienced and successful, the level to which the elements of the WBS are broken down may result in some tasks having less detail and longer duration. Here are some other guidelines for defining tasks:

- **One owner per task:** The tasks must be defined in such a way that they can be assigned to one person (to be responsible for and complete the work).

- **Clear measurable deliverable with measurement specified:** The tasks must be defined so that the task owner can be given clear and measurable completion criteria.
- **Small enough task duration for tracking:** Task duration at the lowest level should be less than 5% of total project time (to ensure a clear view of the task progress), and at a small enough resolution to recognize quickly if the project is off track (e.g., two weeks, if one year; or two days, if two months).

Greater levels of detail are generally required for projects that are:

- Larger.
- More risky.
- Dissimilar to past projects.
- Difficult to define (susceptible to change).
- Performed by internal work groups.
- Planned for the near future.

The WBS will continue to be updated during the Plan and Schedule Development phase. As the process advances, additional tasks may be identified and incorporated into the WBS.

The checklist below will help the team validate whether their WBS has a sound basis for the project's schedule to move forward.

WBS Completion Checklist

Appropriate level of detail: Continue to break down the work until the resulting task list meets the following criteria:

- One (and only one) owner can be assigned to each of the lowest level tasks.
- Clearly defined outputs are evident for each task.
- Quality can be monitored through performance criteria associated with each output.
- The tasks clearly communicate the work to be accomplished to the accountable team member.
- The likelihood that a task is omitted or work flow forgotten is minimized.
- Each task is well enough defined and small enough so that estimates of duration are credible.

- The project is broken down to a level that can be tracked.
- As a general rule, the lowest level tasks should have durations between two and 20 days, and effort that equates to not more than one “person week.”

No forgotten tasks: Project delays are often caused by forgotten tasks rather than inaccurate estimates. Ensure that the estimates include the following tasks:

- Planning the project.
- Approval cycles.
- Key project meetings.
- Management/customer interfaces.
- Quality inspections/repairing defects.
- Training.
- Management.
- Test planning, development & execution.
- Project reviews and project closing.

Task Identification and WBS Creation Planning Worksheet

The table below can be broken down to correspond with major groups of tasks as defined by the top levels in the Work Breakdown Structure. This worksheet supports completion of the WBS by different team members, or groups, at the same time.

WBS Level	Task Name (No.)	Deliverable Description	Task Owner Name + [FTE*]	Other Resources Needed Name+ [FTE*]	Specific Competencies, Skills, Experience needed	Estimated Task Effort & Duration	Dependencies and Assumptions	Any Specific Date Constraints e.g., required start or finish date
1								
2								
3								

* FTE means "Full time equivalent." Express a person's or a generic resource's involvement as a percentage of full-time, e.g., [0.5] for half-time.

Task and Deliverables Resource Assignment

This section addresses identifying resources for each task in the Work Breakdown Structure (WBS) (See Figure 6 - Task & Resource Assignment). The Task Identification and WBS Creation Planning Worksheet (above) can be used to track the assignment of project tasks to an individual owner for smaller projects, or to capture resource assignment data on any project before entering scheduling information into another tool.

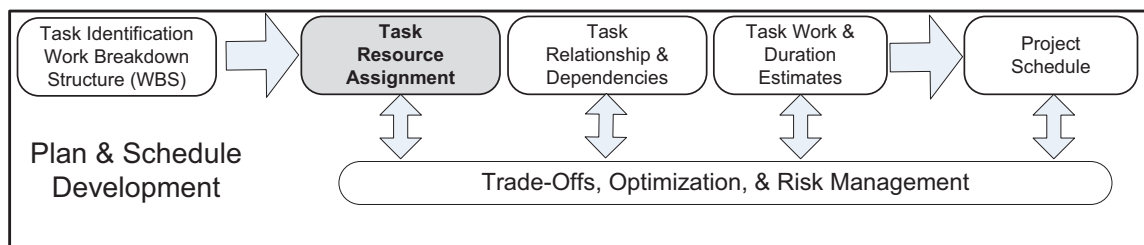


Figure 6 - Task & Resource Assignment

Resource assignment and balancing among conflicting demands is a core project management responsibility. As tasks are defined and the next step of assigning ownership and staffing is begun, it is important to record the results so that all impacted parties are aware. Formalizing the resource assignment, and making these commitments visible in a brief form helps to ensure the following:

- Timely staffing of the critical, high-leverage period of project initiation and ramp-up.
- Consideration of the required skills and experience when assigning resources to tasks.
- Commitment by functional managers to their team members' specific involvement.
- Avoidance of down-stream resource conflicts with other projects.

It is important for the Project Manager and Team to understand that the first pass in assigning resources to tasks (or deliverables) does not necessarily establish a resource commitment. Assignments must be reviewed with functional managers and balanced against the needs of other projects before they are committed. In many cases, resources should not be assigned a task without the specific knowledge or approval of the resource's immediate manager or supervisor. However, the first pass will give the Project Manager and functional managers a sense of what resource types (and specific team members) will be required for different project activities.

Identifying Members on the Project

The Sponsor, Project Manager, and Core Team Members will have been identified and participating regularly by the time detailed project planning starts. Many project contributors may have also been identified.

Note: *A main objective in this guideline is for the project's work to aid in identifying the required resources for various tasks (based on skills and competencies needed to perform the work).*

Communication during Resource Assignment

Before assigning resources, *advise the stakeholders* of the team's efforts to assign resources. Communication with the team is critical because:

- Timely staffing of the project is essential to the project's success (e.g., rather than waiting, it is better to first persuade the sponsor to help acquire additional resources should they be required.)
- Obtaining true commitment from team members' functional managers regarding those team members' availability and responsibility for assigned tasks.
- Avoiding down-stream resource conflicts with other projects by understanding when resources are assigned to other projects, and working out conflicts ahead of time.
- Highlighting in advance any non-staff resources that will be required (many of which could require purchases, contracts or scheduling) so lead times can be considered.

Keep the sponsor, key functional managers, and support staff (such as purchasing) informed about:

- When the team is actually initiating resource assignments, and what inputs are required from them, and due date(s).
- When the Project Manager might expect to meet with them to review initial assignments.
- When Project Manager will need commitments in order to finish the scheduling process on time.
- Areas where the Project Manager anticipates resource problems and what help Project Manager will be seeking from them (especially from the project sponsor.)
- Resource conflicts or shortfalls, as they appear during work planning.

- An overall picture of the project's resource needs, as draft assignments are completed.

Assigning Resources

During this process, it is important to focus on *Skills*, *Competencies* and *Experience*, before assigning names.

Project team member selection and task assignment are major factors in any project's success. When starting project planning, the team will probably already include at least one core team member from each functional group. However, all team members may not be identified until the work is better understood. Using the WBS (which was started in the previous step) the specific work that has to be done is more clearly defined.

Identifying the *competencies* needed to successfully accomplish each phase and task of the project is critical. When these competencies have been defined, every effort should be made to assign individual team members with the required skills and traits (or to acquire the needed skills for the team if they are not already assigned to the project). In addition, Project Managers may be assigned team members without a thorough assessment of the required skills for that project. Once the competencies needed for the project tasks are identified and those of the current team are understood, the Project Manager can create a plan to fill any gaps.

Therefore, the resource assignment part of project planning should include the following steps to ensure that the required skills and experience have been taken into account:

- Identify and record the skills and competencies required to achieve the project's mission as expressed by the tasks in the WBS. (Include required skills or experience-levels, but exclude team member names).
- Assess the experience, competencies and skills of current team members.
- Make appropriate task assignments to existing team members by identifying the person with the appropriate skills to do each task, and record the assignment.
- Identify gaps: What required skill(s) or experience is not covered by the current team?
- Be certain the project sponsor and functional managers are notified of the gaps in order to initiate the process of acquiring additional team members.
- In areas where skills are lacking, consider creating additional tasks for training and/or hiring.

The attitude and availability of the team members is also important to the success of the project. If team members feel that they are being forced to work on a project they find excessively challenging, team and project effectiveness can be significantly

affected. Creating a healthy project environment depends on matching the team with the tasks, as well as with the true skill and resource needs of the project. The resource assignment process should be done thoroughly during planning and scheduling. This will help ensure that appropriate team members are assigned to the project, and are involved early in the planning process. This will help ensure the team's "buy-in" to the schedule they will create together.

Steps

1. Record any specific skill or experience needs for tasks listed in the WBS.
2. Assign specific task owners. The owner may not do any (or all) of the work on the task, but they are responsible for ensuring the task is completed.
3. Record a resource assignment for each task identified in the WBS by selecting the appropriate skilled resource to match the work.
 - Specific person: If a particular person must execute a task, record that person's name.
 - Generic functional resource: If a particular person is not essential for a task (or not yet assigned to the task), identify the generic need (such as "senior writer") to describe the experience level and functional group from which a resource can be requested.
 - Level of effort: Include the level of effort assumed in terms of Full-time Equivalents (FTEs). Include whether the task will require full-time or part-time work, expressed as a percentage. This will capture information about team members needed full time for a task, as well as those needed part-time to assist or review. Such assignments will be refined later (in the scheduling process) as the work associated with each task is estimated. At this point, the WBS will display a sufficient amount of assumptions to help managers view the overall resource needs for the project.
4. As resources are assigned, review assignments with the team as a group and with individual team members. Set expectations for their involvement in the next step (planning and estimating each task's work).
 - Each named person will be directly involved with estimating their assigned tasks. If a resource has not been named, someone from the functional group must assist in estimating the tasks; even if they will not be the actual team member assigned the task.
 - Important: A team member with domain knowledge must be involved in estimating.
 - When Initial task estimates are made without the involvement of the person ultimately assigned, make a note that the estimate is "preliminary."

Important: Estimates that do not involve the people doing the work will significantly increase the schedule's susceptibility.

Owners and Resources to Tasks Assignment Planning Worksheet

The table below can be broken down to correspond with major groups of tasks as defined in the Work Breakdown Structure. This worksheet supports completion of the WBS by different team members, or groups, at the same time.

The task-resource assignment table should be marked as a "DRAFT" until the plan/schedule development activity is complete. Resource assignments are not true commitments until the full schedule has been developed, trade-offs made, and the plan optimized among scope, schedule, and cost/resources.

WBS Level	Task Name (No.)	Deliverable Description	Task Owner Name + [FTE*]	Other Resources Needed Name+ [FTE*]	Specific Competencies, Skills, Experience Needed	Estimated Task Effort & Duration	Dependencies and Assumptions	Any Specific Date Constraints e.g. required start or finish date
1								
2								
3								

*Full Time Equivalent. Express a person or generic resource's involvement as a percentage of full time e.g. [0.5] or [50%] for half-time.

Identifying Task Relationship and Dependencies

This section focuses on identifying dependencies, and includes a table for capturing them (see Figure 7 - Identifying Task Relationships & Dependencies).

Note: This task should be completed before the scheduling process is started, because it often leads to some re-partitioning of the tasks in the Work Breakdown Structure (WBS).

Though software scheduling tools have powerful graphical interfaces for entering and managing dependencies, an initial high-level manual pass may help to re-partition the tasks more efficiently (prior to attaching durations and dates, which adds another level of complexity).

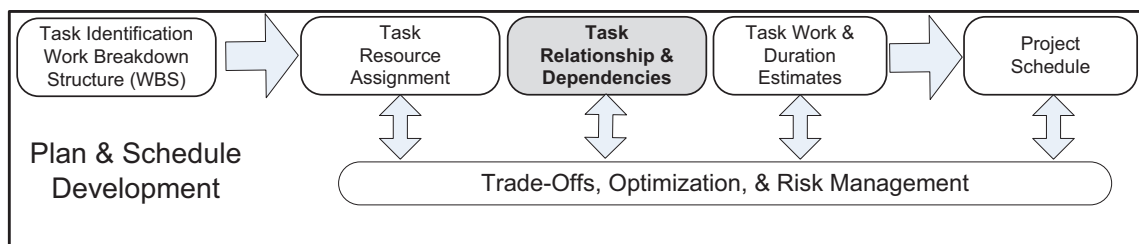


Figure 7 - Identifying Task Relationships & Dependencies

After the tasks are defined and initial resource assignments are made, engaging in a discussion of dependencies is a logical step. This often has a major impact on the task definition and breakdown, and subsequent estimates. This process can also provide a stimulus for communication within the team, affording them a better understanding of the inter-relationships and dependencies related to their work. Dependency work usually results in some re-partitioning of the tasks, so this process may be done repeatedly with the preceding work breakdown efforts.

Level of Dependencies to Identify

Dependency identification is the lowest level of work sequence in the WBS, and focuses on reconstructing the larger schedule, as task sequences build upon each other and integrate into the higher levels of the plan.

Task Relationships and Dependencies Defined

The best way to define tasks and deliverables is by viewing a flowchart of the breakouts and how they interconnect (see Figure 8 - Task Relationships and Dependencies, below).

Tasks are executed to create a deliverable.

- Deliverables are exchanged to provide inputs to other work on the project, thus integrating the scheduled work of multiple groups.

- Connecting all Task sequences and deliverables dependencies creates an integrated cross-functional schedule.

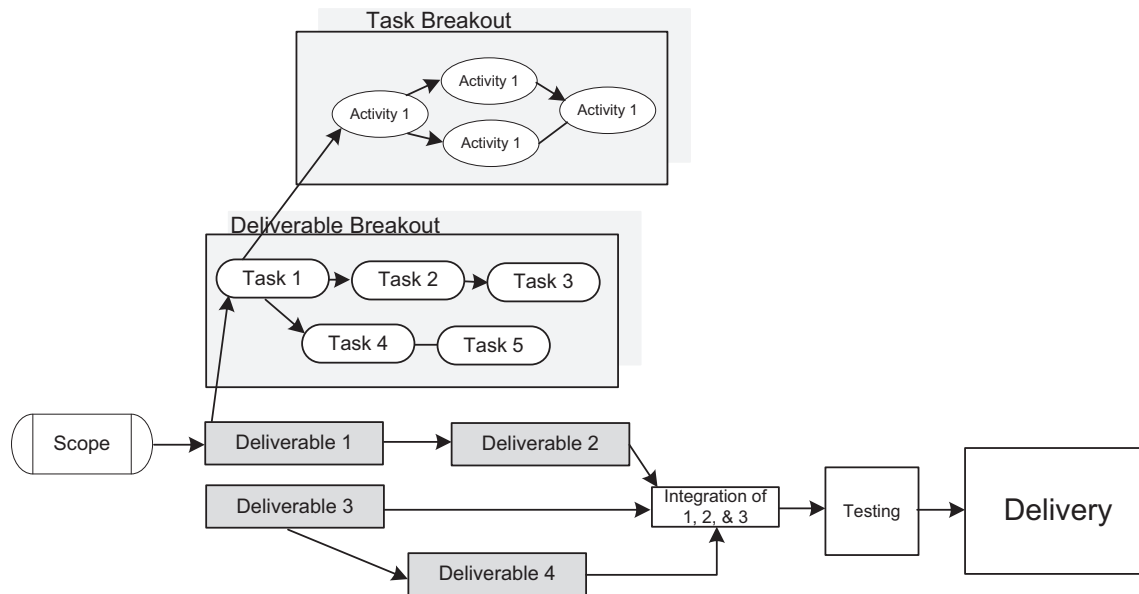


Figure 8 - Task Relationships and Dependencies

Types of Dependencies

There are several ways to express the variety of ways work can be related, i.e., the “constraints” that one task can have on another. These relationships are illustrated below (see Figure 9 - Dependencies).

Finish to Start: The predecessor task must be 100% complete before the successor task can start. (The successor’s start is constrained by the predecessor’s finish date.) E.g., power must be available before the servers can be installed.

Start to Start: The successor can start as soon as the predecessor starts. (The Successor’s task start is constrained by the start of the Predecessor task.) E.g., installation of the first power line enables the start of the server installation.

Finish to Finish: The successor cannot finish until the predecessor finishes. (The Finish of the successor is constrained by Finish of the predecessor.) E.g., installation of the Operating System on the servers can not finish until the last server is installed.

Lag time and lead time: Delay between tasks. (In addition to one of the other dependency types, a delay or “lead time” is added.) E.g., server installation must be completed, and a burn-in period of 5 days is required before starting to load applications.

Milestones: No duration and no effort. Marks a point in time. This is not actually a dependency type, but identifies the start or completion of a set of

tasks (with one of the above dependency types being related to the task. E.g., the start or completion of a set of tasks.)

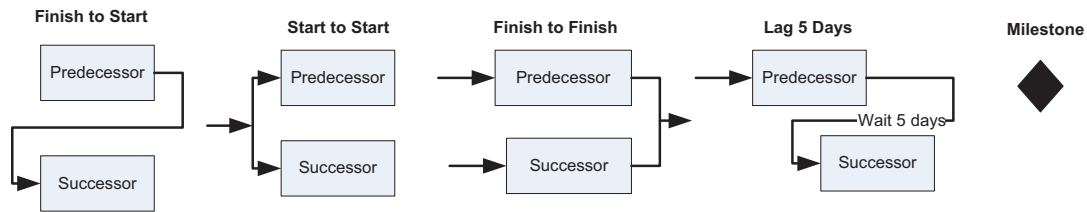


Figure 9 - Dependencies

Identifying Dependencies

Personal Tasks: Have each team member define the dependencies within their sections of the schedule.

Team Member Dependencies: To help identify dependencies among team members' individual task sequences, have team then define what they need from others to do their work. Examples:

- A developer needs a specification from the Marketing or Business person's "requirements definition activities," before he can start design work.
- A developer needs review feedback from peers who are responsible for the design of related elements of the system before he can complete his sequence of design tasks.
- A documentation organization needs deliverables from all groups creating part of a system before they can start (and complete) customer support documents.

Deliverables Dependencies: Have the team discuss the purpose of deliverable items such as test plans that are prerequisites for later test activities, to ensure that the right dependencies and deliverable timing are established. For example:

A team creates the Beta Test Plan that is immediately succeeded by the execution of the Beta Test. Theoretically; the teams' first attempt at the plan has the Beta Test Plan completed just in time to execute the Beta Test. If this were the case, the team failed to take into account the amount of time needed to identify needed resources, equipment, approvals, etc., so the plan was not written early enough for the testing to be completed.

To establish accurate timing for the deliverables, the team should ask themselves the following questions:

- When do we have enough information to start the plan (or any other deliverable), and when is the earliest that someone else on the project might need the plan? (If something is already known, and that information could

benefit someone [feed their work], then a dependency occurred earlier than first anticipated.)

- What happens when we create the deliverable so late that the recipient will not have time for iterations or recovery from “gotchas”?

High-Level Dependencies: The team reviews the major elements (top levels) of the WBS and discusses the dependencies at those levels. E.g., what tasks within the planning phase must be completed before starting any execution work?

Review for missing links: Have the team review dependencies and look for missing links.

Identifying Task Dependencies Task Planning Worksheet

The table below can be broken down to correspond with major groups of tasks as defined by the top levels of the Work Breakdown Structure. This worksheet supports completion of the WBS by different team members, or groups, at the same time.

WBS Level	Task Name (No.)	Deliverable Description	Task Owner Name + [FTE*]	Other Resources Needed Name+ [FTE*]	Specific Competencies, Skills, Experience Needed	Estimated Task Effort & Duration	Dependencies and Assumptions	Any Specific Date Constraints e.g. required start or finish date
1								
2								
3								

Task and Duration Estimating

This chapter addresses estimating the work effort and work duration for tasks identified in the WBS. The table used for gathering the Task Assignments and Deliverables is again used in this section, but with the focus on the “Estimates” column. Task estimating should be done after the first dependencies identification task, so that the resulting repartitioning can be completed.

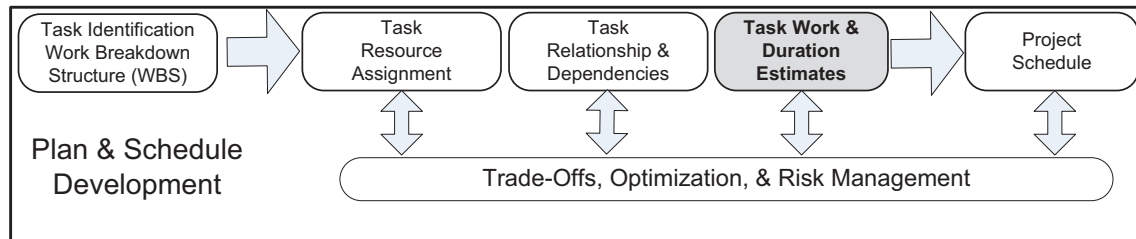


Figure 10 - Task Duration and Estimating

Estimation of the work effort and duration should be done visibly, with the responsible team member actively involved. The person responsible for delivering a task must commit to the estimate for the work effort. Team members know (at the work level) what it takes to get the job done, what their work environment is like, what tools and other supporting resources are available, and how these will affect the amount of time needed get the job done.

Following the planning sequence, estimating all the tasks in the WBS to feed the scheduling process helps ensure that the plan develops methodically and is based on the work the team has defined.

To achieve this, the Project Manager must involve the team in the estimating process. Points of discussion should be:

- How to ensure good estimates so the team can build a schedule everyone will believe in and support. Reviewing key guidelines from this document should ensure that team members are using consistent estimating approaches and assumptions.
- Identification of the functional managers' roles of providing task estimate inputs or "sanity checks."
- Deciding how to use the worksheet to capture information, for example having individuals' record estimates for their own tasks, having sub-teams estimate and review a major section of the WBS, etc.
- If already entering information into a scheduling tool, how will additional information will be collected and/or entered into the WBS tool?

This plan development sequence started with the WBS as the project schedule's foundation. This approach is referred to as "decomposition." The WBS decomposes the project's work into the set of detailed executable tasks. These detailed tasks are

estimates of assigned work effort. The decomposition method will produce a “bottom-up” estimate for the entire project, providing reasonable confidence in the team members’ lowest level estimates.

When estimating tasks, the following distinctions between duration, effort, and calendar time should be kept in mind:

- **Effort:** The “person-hours” required to complete a task, without considering any slack or waiting time, non-working days, other delays, nor the number of people working on a task. It is the pure amount of work that task will require.
- **Duration:** The raw number of working hours required to complete a task, taking the number of assigned resources into account. Therefore, a first-pass duration estimate for a task requiring 4 days of effort would be 4 days if only one resource is assigned, or 2 days if two full time resources are assigned.
- **Calendar time:** The time spent when completing a task, considering the resources assigned plus assignees’ work hours, holidays, slack time, wait time (for necessary inputs, etc.).

This estimating step is used to determine *task work effort and duration*. As the team optimizes the integrated plan (searching for resource constraints etc.) the estimated calendar time for each task will develop.

When using the WBS decomposition approach for projects with areas of significant risk or uncertainty, only limited amounts of understanding will be available early in the project. Therefore, the team may not attempt to acquire detailed estimates for an entire project timeline, but decompose the WBS as much as possible (given what they know at this point). This would yield the most accurate estimate for very near-term work, or very low uncertainty/low risk work. For other areas, the team would initially make only high-level estimates until they have more information.

Estimating Data Sources

The key to achieving the best estimates is to use as many appropriate sources existing information, such as:

- **Project Historical Data:** Historical data from previous company projects or personal work on a similar project can be used to create a baseline estimate.
- **Rules of Thumb Data:** Review and adapt typical estimates from past history or industry norms, for entire projects, phases of projects, typical deliverables, etc.
- **Sizing Estimates:** Estimate pieces of a project as part of decomposition: Size the tasks based on work requirements, and the number of components in the deliverable, e.g., chapters in a book.
- **Team Members and Other Experts:** Several different mechanisms are available for getting estimating input from others.

Steps

At this point, tasks have been identified and dependencies have been specified. Although planning is about to become very iterative during the task definition, estimation, and task scheduling processes, the Project Manager should attempt to estimate all tasks in a “first-pass,” without imposing overall date or duration expectations on the team members. (The Project Manager’s desired calendar dates might cause the team members to “doctor” their estimates to fit expectations instead of modeling the actual work. This could result in a plan that is satisfactory to the stakeholders but difficult or impossible to achieve.)

Important: *The Project Manager does not set the estimates, but will integrate information and sanity check the estimates of the team members who will be doing the work.*

These procedures should be included in all estimating work:

1. Prepare the team for the estimating process. Communicate how important their participation is, and get their commitment to a realistic estimate.
2. Have each team member make an initial work effort estimate (the number of hours of work they believe the task will require for each assigned task). If using the worksheet included in this document, fill in the Estimated Task Effort & Duration column.
3. The person assigned to a task creates the estimate. Team members know at the working level what it takes to get the job done and they need to be able to commit to their estimate. Ensure that everyone who should be involved in the process is identified. In addition, team members’ functional managers may also need to be included.
4. If more than one resource will be assigned to a task, (which would be indicated in the Task Owner [name] and Other Resources columns of the worksheet for that task), the “Duration” estimate can be obtained by dividing the number in the work effort column by the number of resources assigned.
5. Monitor task sizes. The purpose of decomposing the WBS is to ensure that tasks at the lowest level are small enough to allow the most accurate estimate. If a task effort estimate exceeds two weeks, consider breaking it down into multiple tasks.
6. Identify tasks with highly uncertain estimates, mark them as potential schedule risks, and capture their minimum and maximum effort estimates.
7. *Do not spend a lot of time on the first-pass of estimating.* The next step in plan development, scheduling and optimization, may result in redefining and re-partitioning some tasks. In addition, the planning process will become more iterative during the task definition, estimation, and scheduling processes.

8. Get commitments. As the schedule firms up, estimates may get re-visited and refined. Ultimately, the person responsible for delivering a task **must** commit to the estimate for that task.

When estimating task effort, decide now how to include overhead or “off-task” activities, such as meetings, training, holidays, personal time off, unscheduled maintenance and support tasks, coaching, knowledge transfers, and other necessary interruptions and distractions.

Task Estimating Task Planning Worksheet

The table below can be broken down to correspond with major groups of tasks as defined by the top levels of the Work Breakdown Structure. This worksheet supports completion of the WBS by different team members, or groups, at the same time.

WBS Level	Task Name (No.)	Deliverable Description	Task Owner Name + [FTE ¹]	Other Resources Needed Name+ [FTE ¹]	Specific Competencies, Skills, Experience Needed	Estimated Task Effort & Duration	Dependencies and Assumptions	Any Specific Date Constraints e.g. required start or finish date
1								
2								
3								

Project Schedule and Critical Path

This chapter describes how to schedule activities to be performed on the WBS Task Name column that will result in an integrated calendar and schedule (see Figure 11 – Project Schedule & Critical Path). At this stage, the schedule will have undergone a first pass for resource assignment, dependency identification, and estimation.

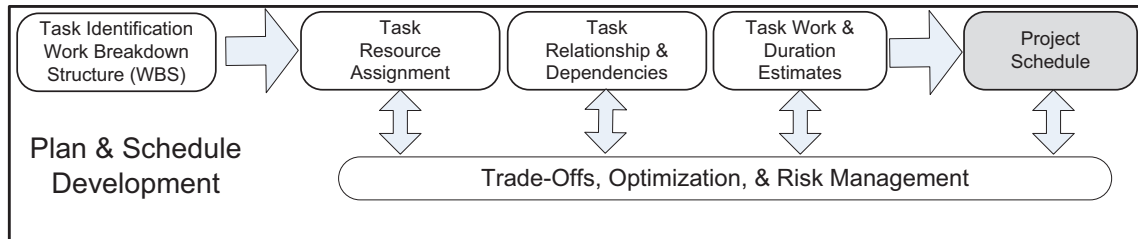


Figure 11 - Project Schedule & Critical Path

Scheduling is the translation of tasks and their estimates and dependencies into a sequence laid out in calendar time. In the first version of the WBS, resource assignments, etc., will typically reveal the magnitude of the time and resource issues. This will also produce a starting point for an iterative schedule optimization process, rather than a completed plan.

“The Schedule” (or the key dates resulting from the calendar schedule) is critical to senior management, representing a tangible delivery commitment for something that will benefit the company. They will review dates, ask questions, and manage delivery of resources (and logistics) in keeping with the dates indicated in the schedule. For this reason, it is *critical* that no team or project manager commit to any schedule without building that schedule on a solid foundation of team planning. No senior manager who wants to be successful should be party to “quickie scheduling.” It is not good for the customer, the company, or the project team. However, the first-pass schedule, followed by iterative adjustments, will provide substance for highlighting issues for executives and involving them in the next step (optimization and trade-offs).

Note: *Ensure that interim schedules and dates are understood to be temporary!*

Important: *We will **not** have the schedule completed at the end of this step.*

Once a first pass has been taken through work breakdown, task ownership, dependency identification, and task and duration estimates, perform the scheduling activities in the Conduct a baseline Sanity Check on page 33.

If a software-scheduling tool is not already in use, enter the schedule information from the worksheet used in previous steps into the tool now.

Steps

In order to create the calendar-time schedule from the task, resource, dependency and estimates completed by the team, follow the steps listed below. (If a team has used a

scheduling tool to capture the WBS, resources, etc. from the beginning, some of these steps will have been executed in parallel with the development of the original plan.)

Note: *Each of these steps is covered in more detail following this overview.*

1. **WBS:** Keep the WBS levels as outline levels and enter all task names into the tool.
2. **Resources:** Enter named resources and resource groups for the tasks.
3. **Dependencies:** Note all dependency relationships among tasks and blocks of tasks.
4. **Estimates:** Enter work effort for all tasks. (See important note about how tools will manage effort-driven vs. duration-driven task calculations in Figure 13 – Task Duration Auto-adjustment.
5. **Critical Path:** Study the Critical Path in the planned schedule that defines the shortest possible time to completion, and look for initial obvious opportunities to shorten it. (Further work on the critical path can be done during the Optimization and Trade-offs step.)
6. **Initial Resource Issues:** Review resource usage in the schedule for individual peak work overloads and any obvious solutions. (Additional resource leveling will be done during the Optimization and Trade-offs step).

When these scheduling steps are completed, the next activities will include optimizing the schedule and preparing the baseline project plan for approval, and transitioning the project to execution.

Entering Information into the Scheduling Tool

Entry Views

Either a Gantt chart view or a PERT view (or both) can be used for entering information and viewing the schedule. These tools typically provide a table, or spreadsheet view, for entering information. Sometimes PERT charts reveal complex dependencies more clearly. Gantt charts are more compact and provide more information per unit area, as well as clearly display the tasks as compared to calendar time.

While using a Gantt or PERT view during task scheduling, periodically review other tabs in these scheduling tools (see Figure 12 – Other Scheduling Tool Tabs) for common tabs available for review.

Resource Sheet	A table-view for entering resource groups and names, which will form the resource pool for task assignment (as the WBS is completed).
----------------	---

Resource Usage	A table of resource names and task assignments (over time) showing person-hours during each time period for each resource, both by individual task or total tasks and resources (rollup).
Resource Graph	A bar chart (or histogram) showing resource time assignments that exceed 100% of available time.
Critical Path tasks	A list of the tasks currently on the critical path, or a graphical view with the critical path clearly marked by task colors, or some other method.

Figure 12 - Other Scheduling Tool Tabs

Entering Resource Assignments

- If the scheduling tool provides a “resource sheet” view for entering a resource pool, go to that view and enter the names (and groups, if desired) for each project team member, or potential member.
- In the Preferred Task entry mode, add resource names for each task.

Note: *If a task will have multiple resources assigned, it is suggested that the “owner” of the task be listed first to represent overall responsibility, followed by other resource names.*

- As each name is entered, include the percentage of time they will spend on the task. For example “Joe Designer [.4]” would indicate that Joe Designer will be working on the task for 40% of his time. (Be sure to do this for the task owner—if different from the actual working resources—since an owner would typically spend a small percentage of their time overseeing, but not working on the task.)
- As an alternative for situations where a task owner is not working on the task, some people use the tool’s user-defined text field for storing the “owner.” With this approach, the resource field is used only for people who will actually be working on the task.

Note: *If this approach is used, be certain to include actual owner “work time” in the resource field for any task the owner performs, such as reviews.*

Entering Dependencies

A pitfall when working on tasks in scheduling tools is to “hard code” the start or finish dates. Since the tool is capable of constructing a schedule and calculating dates based on task lengths and dependencies, hard coding the start or finish dates loses

sight of the main reason for using a scheduling tool. Hard coding also reduces flexibility in making schedule adjustments.

Use the tool's dependency aspects correctly, and only use constraints for tasks that actually have date constraints. For example, in Microsoft Project, a number of constraints can be assigned, including "As Soon As Possible" (the default, which will result in the task's timing being driven by the timing of the predecessor task), "As Late As Possible," "Finish No Earlier/Later Than," "Must Start/Finish On," and "Start No Earlier/Later Than."

Do not enter dates for task START and FINISH times except for a task at the beginning of the project, or a major sequence of work that must start at a certain time. Entering dates into the START and FINISH date fields in MS Project, for example, will cause those tasks to be hard-scheduled for those dates (with a constraint such as "start no earlier than" or "finish no later than"). When other tasks linked to the hard coded tasks move, the linked tasks would not move "in time" (or self-adjust), causing an inaccurate schedule.

As many tasks as possible should be driven (in time) by dependencies in the schedule.

Entering Task Estimates

Use this step for entering task work estimates. Before entering starting estimates, it is critical to decide whether to use the tool's "effort driven" or "duration driven" mode. Be aware of the distinction between "work effort" and "duration:"

- **Unit of Measurement:** It is important to remember that all estimates are entered in hours. In this case 3 days of work refers to 24 hours of effort (i.e., an 8 hour shift work day x 3 days). Some shops may work on a 24-hour per day schedule. In this case the 24 hours would constitute 1 day's worth of work.
- **Effort:** The person-hours required to complete a task. Effort is independent of the number of people working on a task.
- **Duration:** The number of hours needed to complete a task (taking the number of resources into account). A task with a Duration of 24 hours, when assigned to one resource, will have a Duration of 3 days with two resources. Or a shop with a 24-hour work schedule can be divided between 3 resources on 3 different shifts to complete the task in 1 day.

Be aware if the scheduling tool has "effort-driven" scheduling. With this feature, the first resource assigned to a task will cause a hidden computation of "Effort"—the number of hours needed to complete a task independent of resources. Subsequently, any change made to the number of task resources will automatically alter the task Duration. For example, a task is initially assigned one full-time resource and an Effort of 32 hours (4 days). The tool calculates Duration at 32 hours (4 days). If a second resource is assigned to the task, the effort-driven scheduler will re-calculate the Duration at 16 hours (2 days).

(See figure 13 - Task Duration Auto-adjustment) for an excerpt from the Help section of Microsoft Project, which contains a few more examples of how a tool might adjust task Duration based on its settings.

When working with effort-driven scheduling, keep the following in mind:

The effort-driven calculations apply only after the first resources are initially assigned to the task. After the first resources are assigned, the work value doesn't change as new resources are assigned to or removed from the same task.

*MS Project also allows the user to set a **task type**: a characterization of a task based on which aspect of the task is fixed and which aspects are variable. There are three task types: Fixed Units, Fixed Work, and Fixed Duration. The default task type in Project is Fixed Units.*

If the assigned task type is Fixed Units, assigning additional resources shortens the duration of the task.

If the assigned task type is Fixed Duration, assigning additional resources decreases the individual unit values for resources.

Figure 13 - Task Duration Auto-Adjustment

In short, understand how the tool will adjust task work effort and duration calculations, and be aware of the tool's default mode. Decide which mode to use and change the tool settings if necessary. For each "lowest-level" task in the WBS, enter the work hours, or days previously estimated.

Accounting for "Overhead" Work

Keep task durations "pure." As with the Task Estimating step covered earlier, resist the temptation to "pad" task estimates as they are entered into the scheduling tool. **Do not** incorporate schedule attributes as slack time, waiting time, overhead tasks, or work calendar attributes (such as days) into task Durations. These attributes may become hidden in the Duration figures, and as tasks will be lost or distort the schedule during re-planning.

Some of these activities, such as scheduled vacations and holidays, can be incorporated directly into the schedule:

- As Tasks with fixed dates and Durations.
- By using the scheduling program's calendars for blocking out certain calendar days as non-working days for the company.

- By scheduling explicit fixed-time and date tasks for personal vacations and other scheduled overhead.

Other overhead tasks can be combined into an overhead factor that is applied evenly. For example, some companies adopt a standard assumption about the amount of an employees' time is actually available for project work (given other requirements such as general meetings). These companies monitor resource usage in order not go above 80% for any person on project work. A factor such as 0.8 (32 hours of actual task work in a 40 hour work week) is typical (and 0.6 is not uncommon).

For activities such as maintenance and support, which are fairly periodic but unscheduled, a "phantom" task with an average duration can be created and periodically scheduled into the plan. For example, if an average of 20% of an employee's time is spent on support activities, create a weekly day-long task called "support." For the weeks with no support time, the employee will be ahead of schedule. For the weeks where 16 hours (2 days) are spent, the employee will drop back. On the average, the schedule will correctly account for this time.

The important point is to be sure to account for all of these "off-task" activities consistently activities across the project team in some way. Be sure to document all assumptions in writing and share them with the team. Ensure that everyone is consistently estimating overhead using the same assumptions.

Critical Path

The Critical Path is a string of activities that, if delayed, will delay completion of the overall project. It is the path in the schedule that has no slack time—the longest and least flexible sequence in the project. Virtually all software-scheduling tools will help identify tasks in the critical path.

To complete the first pass schedule, identify the critical path and initially look for obvious ways to reduce its length, and accelerate the schedule. For example:

- Shorten critical path activities by asking:
 - Can any tasks in the critical path be reduced in Duration? (For example, by applying extra resources to work on the task in parallel.)
 - Can activities be shortened that are the least costly to speed up, (i.e. paying fees to expedite them, if that makes sense.)
- Overlap tasks:
 - Can any of the tasks in the path be overlapped?
 - Are there task dependencies that can be started earlier with partial information from another task? (e.g., use draft documents to let the second task get started earlier.)

- Add more resources to parallelize work.
- Conduct a baseline Sanity Check.

Sanity Check

Finally, review the baseline schedule for completeness before moving to optimization.

- Check the tasks based on the WBS, is the work broken down far enough to accurately gauge progress by tracking tasks?
- Sanity Check the task estimates with all involved, including the project team, and managers.
- Have the entire team review the schedule dependencies for missing links.
- Ensure all cross-functional work is accounted for.
- Make sure all tasks are assigned to resources, with no resources overloaded.
- Sanity Check, the schedule to allow for time to prevent and detect defects. In the Project Schedule, define the reviews and testing for each phase.
- What design reviews will be used?
- What testing will be needed?
- What is the test plan for reviews?
- What will the test results reviews be?
- Check for ways to shorten the critical path, and continue to monitor as the schedule evolves.

Project Plan Optimization and Trade-Offs

This section on plan development includes reviewing a list of activities that can help optimize a Project Plan after the first pass Base Schedule has been developed. This process can facilitate resolving the conflicting objectives in Scope, Schedule, and Resources that resulted from defining the project objectives.

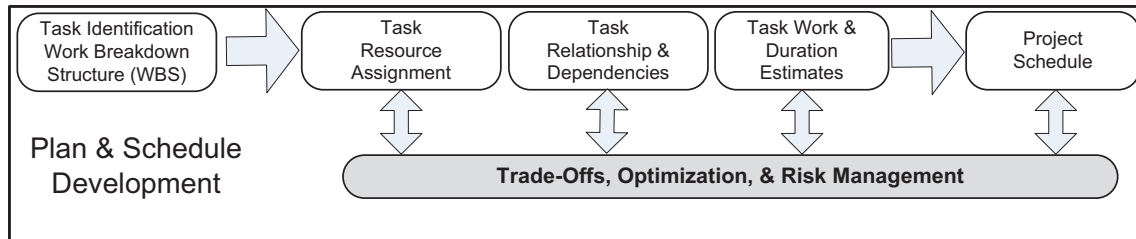


Figure 14 - Project Plan Optimization & Risk Management

The first pass in scheduling a project rarely leads to an acceptable balance between:

- Business and project objectives,
- The scope of work necessary to achieve those objectives,
- Available time,
- Resources and budget available to the project.

A series of trade-offs must be made in one, or more, of these areas to align the plan with the project's objectives. Risks to meeting the project objectives must also be considered, and related tasks incorporated into the schedule, if necessary.

Once a base schedule has been created, apply the optimization activities listed in this chapter to align the schedule and resource assignments with the overall project goals.

- Revisit the project's overall objectives.
- Revisit (or create) the Project Flexibility Matrix for the project.
- Apply as many of the optimization activities as necessary to align the schedule with objectives, taking into account the available resources and cost targets.
- If project objectives are changed, reaffirm the new objectives with all stakeholders.

The optimization process is iterative with respect to other planning processes, and is likely to cause task definitions, ownership, and dependencies to be redefined.

And finally, be careful when redefining task durations in tasks that have not been otherwise altered.

Important: Do not change durations unilaterally in order to “fit” the schedule. Be certain to reaffirm commitments by the task owners when any duration estimates are changed.

Trade-Off Foundation

The baseline schedule just created as part of plan development must be reviewed to determine if it meets every high-level project objective:

The question to ask at this point is: Can we get the desired scope done, by the desired completion date, with the resources and related budget we have been allocated thus far? If not (which is usually the case after the first-pass schedule creation), the schedule must be optimized using different techniques, which may require trade-offs among the project objectives (see Figure 15 - Project Objective Matrix).

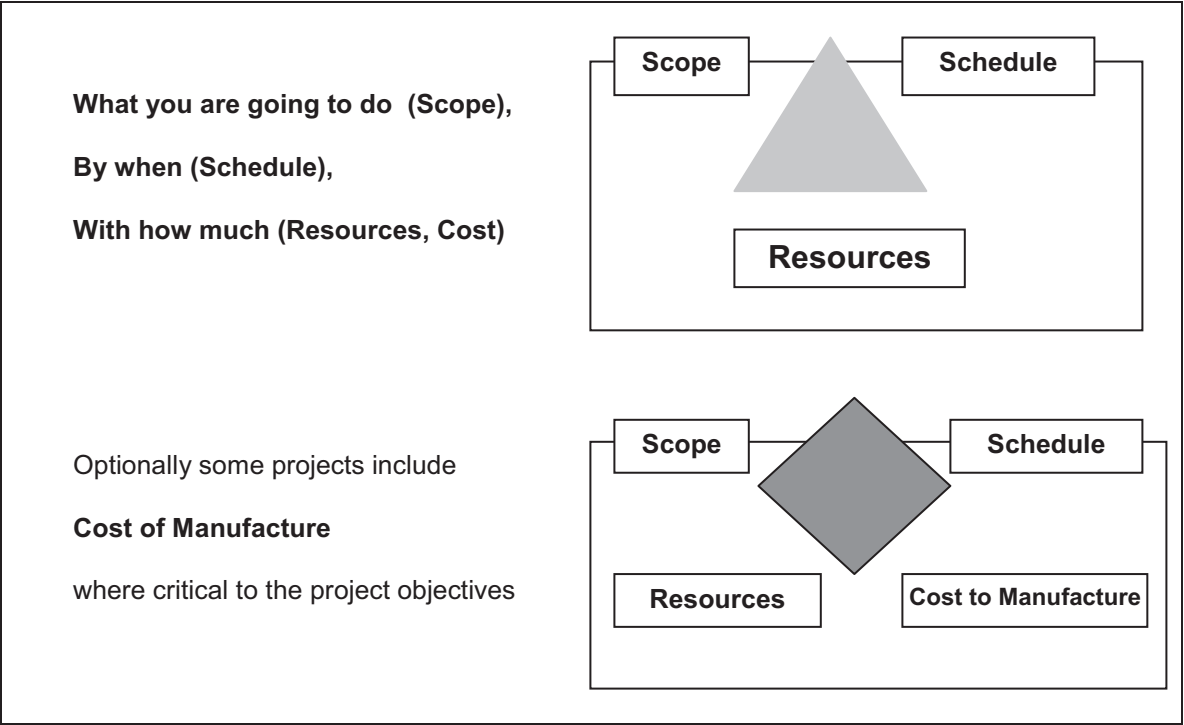


Figure 15 - Project Objective Matrix

The Flexibility Matrix is a tool for decision-making. It helps the team establish agreements on relative priorities among the major project objectives and guides trade-off discussions during schedule optimization.

At this point the team should consult the Project Flexibility Matrix to prepare for optimization (see Figure 16 - Flexibility Matrix). The matrix will help guide tradeoff decisions during the optimization process. Remember to make any adjustments necessary if tradeoff factors have changed. If a Flexibility Matrix has not been completed, refer to the Project Flexibility Matrix template and create one now.

FLEXIBILITY MATRIX Tradeoff Factors	Inflexible – Most Critical	Adaptable – Negotiable	Accepting – Will Concede
Scope			
Resources			
Schedule			

Figure 16 - Project Flexibility Matrix

Flexibility Examples

Here are a few examples of using Flexibility Information to discern Possible Project Trade-offs.

If Scope is more flexible, consider:

- Negotiating a shift in some features for a later release.
- Negotiating the size of the project's elements, i.e., reduce the number of test sites, to require fewer resources and possibly less time.

Cautions:

- Analyze the business risk of scope-related issues.
- Be sure to reduce scope rather than quality!
- Get management and customer agreement on changes in scope.

If Costs (resources) are more flexible, consider:

- Negotiating for additional resources to parallelize more work.
- Hiring outside resources to complete a part of the project.
- Buying components outside the company to hold the desired schedule and scope, even if it includes paying a premium.

Cautions:

- Avoid un-realistic expectations about the impact additional resources can have on the project schedule time.

- Do not underestimate the potential schedule, scope, and quality risks of utilizing outside resources for part(s) of the project.

If Schedule is more flexible, consider:

- Shifting the completion date to achieve the desired scope using the available resources and targeted project cost.

Cautions:

- If the schedule is allowed to slip, consider potential impacts on other projects that need resources from this one.
- Ensure stakeholders and influencers understand and agree with the new schedule target.
- A relaxed schedule is no reason to relax oversight. Even a “reasonable” schedule can be missed.

Steps

The overall process, using the flexibility matrix to guide trade-off decision-making:

1. Review the flexibility matrix together.
2. Get agreement that the flexibility matrix is still valid or adjust it with agreement of the team.
3. Identify issues in each area: schedule (time), scope, and resources (costs).
4. Agree on which project parameters, if any, should be optimized to address those issues.
5. Use applicable techniques (below) to optimize the schedule.

Optimize Schedule Dates and Dependencies

Review the baseline schedule against any high-level project goal dates from the Project Objectives. Does the baseline schedule, once all task information is integrated, still meet any desired interim and final milestone dates? Based on the flexibility matrix's results, including the priority of schedule vs. the other parameters, use one or more of the following techniques to adjust the schedule to meet the desired dates.

- Re-evaluate logical dependencies and change dependencies to shorten the schedule alleviate resource issues, etc., as appropriate.

For example: A method of shortening a task sequence is to change selected dependencies from finish-to-start to start-to-start. Include a lag wherever practical, but do not unduly risk overlapping the work of those tasks.

- Re-evaluate task work estimates that ultimately drive task durations

Important: Do not change duration estimates just to fit a desired schedule). For example, consider whether use of more senior skilled people could reduce the effort required and shorten the duration.

- Reassign resources (people) from non-critical tasks to critical tasks to decrease the duration of the critical tasks
- Re-negotiate deadline dates if schedule is flexible.
- Change non-workdays to workdays to gain extra work time and meet the desired schedule.
- Consider adding resources to give the project more capacity to complete particular tasks sooner.
- Examine the critical path in the schedule and look for further opportunities to shorten its duration.

Optimize Resource Utilization

Review the resource usage throughout the schedule. Base the flexibility matrix's priority of resources/costs compared to other parameters, use one or more of the following techniques to adjust resources.

- Check the schedule's resource demand with the project's resource availability. Are there overloads on certain resources?
- Identify areas of opportunity; look for certain resources being underutilized that could be deployed on other tasks.
- Temporarily postpone non-critical work to minimize or eliminate over-commitments during critical timeframes, and provide a more even distribution of work for the team.
- Obtain other resources to relieve temporary peaks, such as people from other groups, temps, and contractors.
- Decrease the work-rate per day of an overcommitted resource on particular task(s) to alleviate the overload. However, note that this will increase task duration, so the impact on the schedule dates must be monitored.
- Increase efficiency (and related hours to complete a task) by ensuring that team members are adequately trained.
- Improve productivity by maximizing the amount of time team members work on continuous tasks.
- Re-define tasks if necessary to match resources and realign schedule to meet objectives.
- Re-assess dependencies and split tasks to better fit resource availability and milestones.
- Consult the scheduling tool's Resource Leveling feature for other leveling opportunities.

Important: Be careful when using a tool's automatic leveling features to optimize the schedule. Use the tool in a progression of small incremental steps, and back up often. Stay in control of the decision process during optimization.

Optimize Scope Definition

Based on schedule and resource constraints, reconcile the project scope with customer requirements:

- Negotiate a later release (shift in features).

- Negotiate scope of roll-out, i.e., the number of beta test sites.
- Analyze the business risk of scope-related issues.
- Analyze the process and try to reduce complexity.
- Make/Buy/Leverage components.
- In general, reduce scope rather than quality where appropriate, and be sure to get management and customer agreement.

Consider Risks and Incorporate Risk Management into the Plan

Ensure that the schedule has adequate attention devoted to risk management. Use the project's Risk Analysis and Risk Management Plans to include risk-related items in the schedule.

Examples of Typical Risk Items

Note: *These types of issues should have been raised earlier in planning, and work included in the WBS to account for them. But take this opportunity during optimization to be certain the team has included all the necessary work and resource assignments.*

- Long lead items: Decide the earliest possible purchase dates.
- Staffing risks: Will we have the personnel required for each part of the schedule? Could some resources be pulled off the project unexpectedly? Do we need to allow buffer time in case this happens?
- Technical/Quality risks: Will it work? Do we need extra design or testing iterations built into the schedule?
- Customer satisfaction: Will the customer be happy with what we create? What customer reviews, prototyping or testing should we include?
- Issues with outside partners/vendors: Will we get bumped in priority?

Identify risks systematically

- Check that team roster! Who might pose some kind of risk, which could be dealt with in advance by planning the project differently?
- Check resource loading. Is anyone in danger of becoming overloaded? Who is likely to be taken away to do side work? Would this risk make us adjust our resource assignments in anticipation?

Approaches to handling risk in the schedule:

- Include extra time overall in the schedule.

- Include extra iterations on a deliverable in case it has to be re-done.
- Include extra review and test time including early customer reviews.
- Invest in parallel approaches for creating a particular deliverable.
- Include items in contracts with vendors to emphasize critical areas.
- Prepare contingency plans for risky areas, know when to invoke.

Modifying the Project Objectives Statement

Gain approval from all affected project stakeholders for any changes to the Project Objectives Statement or Project Vision (after Plan Optimization) proposed during the optimization process. Senior management should be continuously involved during optimization.

If the optimized plan meets the Project Objectives:

- Document all decisions and get agreement.
- Ensure that all groups agree to changes.
- Include all changes in the project file.
- Distribute the new Project Objectives Statement or Project Vision to all parties involved.

If the optimized plan exceeds the Project Objectives,

- Prepare a fact-based presentation for management.
- Include cost/benefit and risk for each alternative.
- Include the team's recommendation.
- Negotiate the scope, schedule, and resources and continue re-working the plan until the plan and project objectives are aligned.

Completion Criteria for the Optimization Process

The optimization process is completed when:

- The optimized project plan is agreed to by all stakeholders and team members (including management and the customer).
- The updated project objectives documentation (based on trade-offs made) has been distributed with all changes documented.

Administrative Information

Revision	Author	Date	Sections Affected	Change Summary
1.0				

Current Version	1.0
Date	1/2/2009
Master Document Chapter Number	1
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